ENGINEERING LITERATURE

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Whenever a new industrial art arises or rapid progress is made in an old one a confused and awkward terminology is likely to follow. This is particularly true when, as so often happens, the new developments are proceeding at widely separated centers, but with some interchange of ideas between the centers.

In recent years the art and science of sewage treatment has been making rapid progress. For a number of years, and still to a large extent so far as the United States is concerned, Massachusetts was the center of progress in sewage treatment. Subsequently, great activity was shown in Great Britain. A number of persons in that country made the work of the Massachusetts State Board of Health a starting point for new methods or modifications of old ones, and still other investigators started out on more or less independent lines. As time went on, reports of the results obtained in England reached America and the work done and the quite new nomenclature used abroad were adopted with more or less modification in this country.

It would be interesting to trace the relations between the work done in Massachusetts and by the numerous private investigators and municipalities in Great Britain, but that is foreign to the purpose of this note. The present object is to call attention to the general need of giving more care to the nomenclature of sewage treatment, and to lay particular stress upon the misuse of the term "bacterial processes."

To make the meaning clearer a term correctly used may first be noted. No term pertaining to sewage treatment is better established and more universally used in the same general sense than intermittent filtration. The term was introduced long ago in Great Britain, came to the United States with the process, and became firmly established here by the classic experiments of the Massachusetts State Board of Health on that process.

Although intermittent filtration, like broad irrigation, depends upon bacterial action, and although both processes had been used in Great Britain for many years, yet when the investigators in that country wished a general term to embrace certain newer methods of treatment they chose "bacterial processes." There is little or no justification for this except that the bacterial action in the newer processes is more intense than in the older ones. Strictly speaking, all processes of sewage treatment now in vogue are bacterial, with the exception of chemical precipitation, sedimentation, rapid straining and screening. Even sedimentation and straining cannot be carried on without incidental bacterial action. Screening, of course, is scarcely a process, and the same might be said of rapid straining.

In Great Britain it is possible that the terms bacterial processes, bacterial beds and bacterial filters have become too firmly established to be made to give place to more correct ones, but as time goes on it is quite probable that more specific terms, like contact beds and percolating filters, will be universally adopted. In the United States it seems justifiable to hope that the more specific terminology will become even more general than it now is. That it has been quite generally used thus far is doubtless largely due to the greater foothold of intermittent filtration than of any other single process depending upon bacterial action and also to the early and general recognition here that intermittent filtration is a bacterial process.

The Need of a General Handbook for Engineers.

We hear frequently of the increasing interdependence among the various branches of engineering which accompanies their increasing differentiation. It is becoming daily more important, so we are told, that the mechanical engineer be familiar with the general aspects of structural engineering and electrical engineering; that the bridge or structural specialist be versed in the elements of railway, mechanical, electrical and contracting practice; and so on around the entire circle. These statements are evidently not meant to apply solely to the relatively few who lead in their profession. The extra mental equipment in question is needed in everyday engineering, not merely in extraordinary cases. The wide general education referred to is intended for the rank and file of the engineering profession.

It is true that the courses of instruction in our technical colleges are constantly broadening, and that the graduates from these courses are every year more broadly as well as more deeply trained in engineering. But this greater breadth meets only part of the need. The general instruction which the engineering student receives in other branches than his own is of the elementary or "fundamental" variety. It is planned so that he may be able to think in that field sufficiently for further study. When, however, a problem arises in practice where the engineer is called upon for some knowledge of matters in a field not his own, this "fundamental" knowledge is rarely of much service; instead, a general familiarity with modern commercial practice in that field is called for.

The condensed information and empirical conclusions which are represented in commercial practice and which form the actual skeleton around which that practice is built are not readily accessible to practitioners in other fields. The mechanical engineer has no simple means of learning about practice in structural work, nor has the structural designer ready access to the rules of practice in electrical machinery. The present-day handbooks cannot give the desired information. They are written for a single class, for those who are actually working in the field treated of in the book. They give much that is useless to the engineer working in another field; on the other hand they omit much that is essential to him but would be useless repetition to those familiar with the field. Furthermore, the aggregate of the individual handbooks on various branches of engineering represents an excessive bulk. These books include such a great mass of matter that even in the single handbook there is usually little logical arrangement by which specific items are located. If they were combined in one work, practicable arrangement would be almost out of the question.

It seems that a handbook might be written which would meet the need above indicated; a book in which each branch of engineering is treated from the point of view of the "outside" engineer; lucidly yet compactly, and giving all the information needed by the engineer who wishes to obtain a rapid survey of practice without laboring through the more specialized details.

The task would not be an easy one and the risk of failure would be great. If the preparation of such a book were undertaken by specialists there would be danger that in the fulness of their own knowledge they would omit as obvious many elementary phases of the various subjects treated. Perhaps the best men to prepare such a handbook would be not specialists but those having a good knowledge of engineering in general.

Obviously specialists would be required to correct errors and point out omissions, as well as to help plan the several sections of the handbook.

An alternative plan and one far superior to that first suggested, if only the right men could be found, would be to have the coöperation of specialists possessing the happy faculty of putting themselves so completely in the places of the imaginary users of the handbook as to see just what would be needed by the average user. Under either plan an editor-in-chief would be required, in order to secure harmony of treatment and proportion of parts. This suggests a third and perhaps the only practicable plan, which would be to rely upon a good editor-in-chief to bring the work of specialists within the range of the users of the handbook, effecting this both by coöperation in planning the sections and by simplification and coördination of the work of the several members of the staff.

Finally, it may be asked whether an efficient permanent organization would not be required to keep a general handbook for engineers up-to-date.

A German Book on Superheated Steam Engines.

Reviewed by Storm Bull,* M. Am. Soc. M. E.

THEORIE UND PRAKTISCHE BERECHNUNG DER HEISSDAMPFMASCHINEN.—Mit einem Anhange über die Zweicylinder-Condensations-Maschinen mit hohem Dampfdruck. By Josef Hrabak, Professor at the School of Mines at Pribram. Berlin: Julius Springer. Cloth; 5 × 11 ins; pp. 100; tables. 7 marks or $2.80.

The rapidly increasing use of superheated steam for reciprocating steam engines makes the appearance of a book of this kind very opportune. As, however, it is quite evident that the computation and design of a steam engine making use of superheated steam to a very large extent must be based on the results of tests and practical experience with superheated steam in general, it is permissible to doubt whether the experience gained so far is sufficient to base the computation of the main dimensions of the engine, the consumption of steam and fuel, as the author does, on generalizations of such results. There is no question but that the author has been fully acquainted with all the most reliable results of tests in this direction, and in so far the book is fully up with the times; but it would seem that the author has carried his conclusions rather far when he prints a large number of tables, in which the gain in economy of steam and of fuel is given for various steam pressures, cut-offs and degrees of superheat. The results from tests of engines using superheated steam are not yet so concordant that the conclusions of the author in this direction can be taken without serious doubts. His method of computing the mean effective pressure of an engine to be designed is the same as that used in the author's well-known book: "Hilfsbuch für Dampfmaschinen Techniker," and, in fact, this latter book will have to be used in connection with the new one in order that the methods of the author may be understood.

The last chapter in the book on compound condensing engines using saturated steam of high pressure is a supplement to the older book, as this class of engines was designed for lower pressure only at the time of the appearance of the book.

The book is the result of a very large amount of conscientious work, and as it is the first of its kind, so far as the reviewer knows, it will be welcomed, even if the conclusions drawn should not be found to hold good in every case.

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The American City in its Relation to the Democratic Form of Government.

THE AMERICAN CITY.—A Problem in Democracy. By Delos F. Wilcox, Ph.D. New York: The Macmillan Co. Half Leather; 5 x 8 ins.; pp. 423. $1.25.

The relation of the city to American democracy is the point of view taken by the author in writing this book. Under "Democracy and City Life in America," the author says:

> There are numerous conditions naturally arising from the crowding of men in cities which tend to limit human opportunities for self-development. It is the purpose of democracy to make free men in the fullest sense of the word. It is the problem of the American city, by means of democracy, to assess equitably the tax that nature levies for the benefits of city life upon those benefits, to the end that the city may fulfil its mission as the center of a robust, clean, beautiful civilization, into which the nation's life may pour without danger of corruption. In its more immediate and practical aspect, the problem of the American city is to make itself a place fit for men, women and children to live in. It is my purpose in the succeeding chapters of this book to present to the reader the various phases of this great American city problem as it is working itself out in the varied functions of city government, in the political organization of municipal democracy, and in the relations which bind the city to the state at large.

Having outlined his subject, the author devotes a chapter to "The Street," and another to "The Control of Public Utilities." Few will dispute the opening sentences in the first of these chapters:

> The problems of the street are the first, the last, and the greatest of the material problems of the city. It is the street that makes the city possible to begin with, that permits the city's growth year by year, and that finally must check the increase of population and business by sheer inability to provide opportunity for movement.

Further on the author asserts that "the control of the streets means the control of the city." He therefore urges that the city retain this control for the benefit of its citizens, and so shape the street plan and so develop or supervise the development of transportation and other street facilities as to make the streets of the greatest possible use to all the people. Services demanding special privileges in the streets, like any of those rendered by franchise companies, should be publicly regulated, both as to character and cost of the services rendered.

The chapter on the control of public utilities discusses various phases of franchise limitations and positive provisions, both State and municipal, and also takes up the vexed question of municipal ownership. The author believes in municipal ownership and operation "whenever, after full discussion, the people of a city favor that policy," but each municipal undertaking "should render an unmistakable public account of itself." Franchise-holders should also make detailed financial reports to the city authorities. Franchises should be taxed to their full value, and, both under public and private ownership, prices should be kept down to the cost of service.

The larger part of the book is occupied by a discussion of civic education, the control of leisure, municipal insurance, local centers of civic life, popular and official responsibility for civic affairs and municipal home rule. The author is a believer in giving cities greater powers of self-government than they now possess, and favors central administrative control rather than legislative interference as a means of protecting the interests of the State as a whole. The practice of the several States of the Union in such matters as allowing municipalities to frame their own charters is reviewed.

Municipal revenues and debt have each a chapter. The book concludes with "A Program of Civic Effort," which includes, among ideas not already mentioned, the "initiative, the referendum and the recall," to enable the people to assume a large measure of control of their own affairs whenever they are dissatisfied with the way those affairs are being handled by their representatives. Summarizing, the author says:

> These three principles—
>
> (I) Universal respect for labor,
>
> (II) Universal participation in the burdens and benefits of government,
>
> (III) Direct responsibility of the people for the control of their own public affairs—
>
> are the bases on which the success of democracy in American cities depends,—and if democracy fails here, the story of America will be a closed chapter in the annals of freedom.

Practical Electricity.

MODERN PRACTICAL ELECTRICITY.—Electricity in the Service of Man. A Popular and Practical Treatise on the Applications of Electricity in Modern Life. Vol. IV. By R. Mullineux Walmsley, D. Sc. (Lond.), F. R. S. E., Principal and Head of the Electrical Engineering Department of the Northampton Institute, London. Chicago: W. T. Keener & Co. Cloth; 8 x 10 ins.; pp. 880 to 1,208; 4 plates and 331 figures (Nos. 877 to 1,208) in the text. $3 (for the single volume).

This concluding volume of a well-written and useful work shares the general character of the three preceding volumes;* that is to say, it is written in a simple, easily comprehensible style, with logical and well-developed progression from simple or primitive forms to the more complex or modern. As noted in our previous review, the second part of the work, comprising half the third volume and the entire fourth volume, deals with actual practice; that is to say, describes machines, accessory devices, methods of connection, etc. This is in contradistinction to the purpose and method of the first part, which develops the subject of electricity from the historical and physical standpoints.

The subdivisions of Vol. IV. are: (1) The Magnetic Circuit; (2) Batteries of Generators; (3) Continuous-Current Motors; (4) Dynamo and Motor Testing; (5) Alternate-Current Motors; (6) Electrical Measurements. A great many machines and instruments are described, with the help of a large number of views and drawings. It cannot be said that the field of electric machines or "heavy-current practice" is exhaustively covered, or that the work is a compendium of modern practice in this field. But the main parts of this field are covered in a representative or typical fashion, so as to enable the reader to extend and supplement his knowledge easily by further reading and by observation.

American practice is quite well represented, both in machines and in instruments. It is worthy of note that the section on alternate-current motors includes among other things a good description of the Lamme (Westinghouse) single-phase traction motor, though of course the very recent development of a closely similar motor by the General Electric Co. is not mentioned.

The book leaves the impression that another volume, at least, is to follow, although apparently the fourth volume completes the series. Some large and important branches of the subject of "heavy-current practice" are left untouched; for example, long-distance transmission and its many relations to machines and accessory apparatus; or, again, switch-gear and the switching arrangements of stations and distributing systems.

On the whole, the book may be pronounced a very good basis for self-study of electric principles and practice; its clearness and logical development, and its avoidance of difficult mathematics, contribute largely to this value.

*Reviewed in this Supplement for Nov. 12, 1903.

THE GROWTH OF INDUSTRY IN NEW YORK. Part V. of the Second Annual Report of the New York State Department of Labor. By John McMackin, Commissioner of Labor. Albany, N. Y.: Pub. Doc. Cloth; 6 x 9 ins.; pp. 670; tables and diagrams.

In the exploitation of the natural resources of the State, New York makes a relatively poor showing, though in the value of farm products and farm property it ranks fourth among the States, following Iowa, Illinois and Ohio. But in 1900 New York ranked first in capital invested in manufacturing establishments, in number of wage-earners, in wages paid and in goods produced. The summary of industries shows 78,658 separate establishments, with a capital invested of $1,651,434,799, and a gross value of products amounting to $2,175,726,900, out of something over 13 billions for the United States. The number of wage-earners is put down at 849,656. The range of its industries is a wide one, arranged in the summary under fifteen heads, and New York holds high rank in each one. Leaving out the miscellaneous group, the highest in capital invested are represented by textiles and clothing, iron and steel, paper and printing, and liquors and beverages. The report enters very fully into the details of each group, and into comparisons with other States and foreign countries. Statistical tables take up these industries by counties.

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Frequently engineers and others in charge of a manufacturing business, be it a mill, factory or electric generating station, are called upon to design and purchase a steam power plant or parts of it when their knowledge of the machinery that goes into such a plant is more or less limited, and without being able to obtain the benefit of the advice of a competent consulting engineer. This book will be of special value to this class and to all interested in steam power plant construction.

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This book contains the results and discussions of the series of tests on reinforced concrete conducted by A. Considère. These tests have completely changed the views held on the subject and have become the basis for many theoretical deductions and still more practical applications. The results of these tests have here been, for the first time, collected and arranged so as to present to the engineer a consecutive statement.

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Iron and Steel Works Directory.

DIRECTORY TO THE IRON AND STEEL WORKS OF THE UNITED STATES.—Embracing a Full Description of the Blast Furnaces, Rolling Mills, Steel Works, Tinplate and Terne Plate Works, and Forges and Bloomaries in the United States; Also Classified Lists of the Wire Rod Mills, the Structural Mills, Plate, Sheet, and Skelp Mills, Black Plate Mills, Rail Mills, Steel Casting Works, Bessemer Steel Works, Open Hearth Steel Works, and Crucible Steel Works. Compiled and Published by The American Iron & Steel Association. Sixteenth Edition. Corrected to Aug. 1, 1904. Philadelphia: The American Iron and Steel Association. Cloth; 6 × 9 ins.; pp. xvi. + 468. $10.

Two and a half years ago, when the fifteenth edition of this well-known directory was issued, the iron and steel industry was still in a state of flux, and the revolutionary changes which accompanied the consolidation era that began in 1899 and continued till the end of 1902 were still in progress. Since that time the industry has adjusted itself to the new conditions, and has accepted the trust system of organization and control as probably a permanent condition of the trade.

This sixteenth edition, like the edition of 1901, is divided into two parts. The first part is "chiefly consolidations," and gives a description of the plants and properties of some seventy-five great corporations, of which, of course, the United States Steel Corporation is by far the largest; in fact, it takes 82 pages of this part of the book to record the U. S. Steel plants, as compared with 106 pages devoted to the properties of the other seventy-four big companies. The plants owned by private individuals or by corporations of moderate size are described in Part II., which is arranged geographically, in the manner followed in previous editions of the Directory.

In general the Directory is confined to producers of iron and steel in its various forms. The lists of principal consumers of iron and steel, such as car and locomotive works, stamping companies, shipbuilders and wire works, which appeared in editions of the Directory before the edition of 1901 are again omitted in this, and we assume will be described in a later separate volume as was done last year.

The preface to the volume gives some interesting statistics, which doubtless comprise the most reliable and up-to-date exhibit of the American iron and steel industry in existence. There are now in the United States about 410 blast furnaces, either active or likely to be active when market conditions make it profitable. Their total annual capacity is a little over 27½ million gross tons. There are Bessemer converters enough to make about 13⅓ million tons of this into steel, while about 11⅓ million tons additional can be produced by the open-hearth furnaces. The rolling mills of every sort, worked double-turn, represent an annual capacity of nearly 26,000,000 tons of rolled products. Remembering the large amount of the blast furnace product which is used in the form of castings and forgings, it is evident that in both the steel converting mills and the rolling mills the capacity is such that only the fittest can survive.

Turning to the geographical statistics, it may be noted that New England still boasts five charcoal blast furnaces; and regret may be expressed that the forest covering of any part of New England should still be in process of destruction for charcoal production. The same thing may be said of New York, which has four charcoal iron furnaces still in operation. Western New York has now an active and prosperous iron and steel industry, centering at Buffalo.

In the South, the iron industry is practically confined to Alabama, the Virginias and Tennessee, although there are a few small furnaces and rolling mills in Georgia and Kentucky. West of the Mississippi River, except for the works in Colorado and a small industry in Missouri, iron and steel production and working is practically non-existent.

Over half the furnace and rolling mill capacity of the United States is concentrated in the States of Pennsylvania and Ohio. This is undoubtedly due to the development of the vast iron ore deposits around Lake Superior, and of economical transport of this ore on the Great Lakes. The Lake Superior district in 1903 produced over 26½ million tons of iron ore, or about three-fourths of all the iron ore mined in the United States. Had this vast deposit not been developed, the lower grade iron ores in many other parts of the country would have been turned to of necessity to supply the demand for iron, and activity in iron and steel manufacture would have been distributed more generally throughout the country.

The Directory gives many interesting figures bearing on changes in current practice. Open-hearth capacity, for example, has increased over 3 million tons in the last 2½ years, while Bessemer capacity increased only 629,000 tons. Part of the development of the open hearth is due to the use of the basic process, which is used in 9 million tons capacity of open-hearth furnaces as compared with 2 million tons capacity for open-hearth basic furnaces. In 1884 there were 5,265 puddling furnaces. There are now 3,161, and there has been a decrease of 110 in the past 2½ years.

The steel foundry industry has had a remarkable growth. In 1901 there were 56 open-hearth steel foundries, and these have now increased to 84. Steel castings are also made by 26 crucible steel plants and by a large number of small Bessemer converters. Five electric furnaces are reported, producing ferro-silicon, ferro-chrome, ferro-tungsten and like products by smelting with electric heat.

THE TECHNIC OF MECHANICAL DRAFTING.—A Practical Guide to Neat, Correct and Legible Drawing. By Charles W. Reinhardt, Chief Draftsman, Engineering News. Second Edition. New York: Engineering News Publishing Co. Boards; 11 × 8 ins.; pp. 42; 11 full-page plates and many illustrations in the text. $1.

To this edition considerable supplementary matter has been added, bringing the book up-to-date and introducing material that is useful to the mechanical draftsman. The chapter on Lettering is new; and while the user is referred to Mr. Reinhardt's "Lettering for Draftsmen, Engineers and Students" for a thorough course in free-hand lettering, in the present work the author gives a few suitable alphabets and a number of concise hints as to the proper use of symbols, contractions, etc., and upon the placing and spacing of letters. The chapter on Topographical Drawing is also here added, for the mechanical draftsman may be called upon at times for work of this type. This chapter practically covers the whole field of "sketch maps," with its features of water, relief, culture, and representation of details. The book is abundantly and excellently illustrated throughout, many of the cuts showing works actually constructed. The text is clear and concise, giving evidence of close study of the subject by the author, and the ability to tell others what he thoroughly understands himself—and to tell it so that they will understand. The aim throughout is to instruct in a method of mechanical drafting that is correct in principle, effective in appearance, and is yet rapid in execution.

INDEX TO THE TRANSACTIONS AND JOURNAL OF NEW ENGLAND WATER-WORKS ASSOCIATION.—To December, 1903, Inclusive. Boston, Mass.: The Association. Paper; 6 × 9 ins.; pp. 115. $1.

The publications of the New England Water-Works Association began in 1883 with the yearly Transactions, and have been continued since September, 1886, as a quarterly Journal. Since no index has been issued covering later numbers of the Journal than the one for June, 1893, and since the Journal contains much valuable matter, the present Index will doubtless receive a hearty welcome. Of the Index it need only be said that it is a combination of the author and subject plan, with numerous cross-references, and promises to be very serviceable.

THE TAMPICO HARBOR WORKS, MEXICO.—Terminus of the Mexican Central Railway on the Gulf of Mexico. A monograph by Elmer L. Corthell, C. E., Dr. Sc., Chief Engineer of the Works during Construction. Prepared for distribution at the Universal Exposition, St. Louis, Mo., 1904. Paper; 7 × 10 ins.; pp. 23; illustrated.

This pamphlet gives an historical and a descriptive account of this important improvement, built between 1890 and 1904 by Mr. Joseph H. Hampson, under Mr. E. L. Corthell as Chief Engineer. The general plans are described and illustrated. The entire cost of the work, including engineering, is set down at $2,221,000, gold. Including the railway extension from Tampico to La Barra, real estate, wharves, etc., the Mexican Central Railway reports a total expenditure of $3,157,690. At the St. Louis Exposition, in the exhibit prepared by Mr. Corthell for the Mexican Central Railway Co., will be found a set of four relief models, showing the changes in the bottom of the harbor brought about by the works, and 53 photographs showing successive stages of the construction.

THEORY OF COMPOUND CURVES IN FIELD ENGINEERING.—By Arnold Emch, Ph. D. Reprinted from the University of Colorado Studies, Vol. II., No. 2, July, 1904. Boulder, Colo.: University of Colorado. Paper; 6¼ × 10 ins.; pp. 135-151; illustrated.

The author of this pamphlet published in Engineering News of Dec. 31, 1903, a solution of a well-known problem in field engineering that was intended to show the efficiency of his theory of compound curves. This solution brought out much criticism from engineers; and in view of this criticism Mr. Emch presents in this article the revised and condensed results of the previous mathematical processes that led to the establishment of his present theory of compound curves. The article itself is purely mathematical, and is intended to prove his contention, though the mathematical knowledge demanded is not so very unusual.

THE DISPOSAL OF INSTITUTIONAL WASTE.—By W. Francis Goodrich. A Paper Read Before the Royal Institute of Public Health, July, 1904. Address the Author, 66 Victoria St., Westminster, S. W., England. Paper; 5½ × 8½ ins.; illustrated.

Some of the principles governing, or which might well govern, the disposal of such institutional and trade wastes as can be burned are described in this paper. The references to specific furnaces are all to furnaces of one manufacture, which to that extent makes the paper rather "trady" in character.

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12. Cost of Open Cut Excavation.
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COMPLETE TABLE OF CONTENTS ON APPLICATION

PUBLISHED AND FOR SALE BY **M. C. CLARK, 13-21 Park Row, New York**

Elementary Forge-Practice.

FORGE-PRACTICE (ELEMENTARY).—By John Lord Bacon, Jr., M. Am. Soc. M. E., Instructor in Forge-work, Lewis Institute, Chicago. New York: John Wiley & Sons. London: Chapman & Hall. Cloth; 5 × 7½ ins.; pp. 257; 272 figures in the text. $1.50.

While the author of this excellent treatise on forge practice has written primarily to guide students taking courses in shop work, he has produced a book that will be found useful to employers of blacksmiths who have picked up their trade, not always under proper apprenticeship. The book is written in a style so clear that no one who can read English can fail to understand it throughout, and the drawings illustrating the text are also to be commended for their clearness and simplicity.

The author discusses the principles of welding, and supplements the discussion with a large number of illustrations of welds of particular kinds, such as scarf welds, flat lap welds, round lap welds, ring and band welds, chain-making, butt welds, jump welds, split welds and angle welds. In naming these welds, our object is to call the attention of contractors and others who employ blacksmiths to the practical and detailed character of the information contained in this book, for it is a well-known fact that the number of efficient blacksmiths to be found is seldom equal to the demand. A book of this kind that can be profitably put into the hands of blacksmiths, as well as of students, is therefore an exceedingly welcome addition to the literature of forge practice.

Upsetting, drawing out, and bending, form the subject-matter of a valuable chapter, which is followed by two chapters describing in detail the making of grab hooks, hoisting hooks, bolts, tongs of different types, ladles, crank shafts, connecting rods, knuckles, open wrenches, socket wrenches, weldless rings, trowels, etc.

Another chapter is devoted to steam hammer work, giving concise yet clear instruction on the tools to use and how to use them in forging with a steam hammer. A description of the making and use of dies and jigs for duplicate work is given.

The two chapters devoted to tool steel work, tool forging and tempering, will be found to be especially valuable. The hardening of drills and chisels, and hammers and cutting tools, is discussed and illustrated clearly and fully.

The final chapter gives miscellaneous work, such as brazing, shrinking and pipe bending. The last-named is a process that comparatively few blacksmiths understand, as is evidenced by the numerous flattened pipes to be seen on bends in hand railings. The author gives three or four satisfactory methods of pipe-bending that should be known to every general contractor who may be called upon at times to instruct his blacksmith in the art of pipe-bending. It is not saying too much to add that an employer of men of the different trades should, if possible, know as much about the "how" of the work to be done by his men as the best one of his men knows. Books such as this should serve to instruct not only the students of technical schools but older men, who have had neither a technical training nor an apprenticeship, but, by virtue of other qualifications, are in charge of skilled workmen, who are often not so skilled as they would have their employers believe.

STAIR BUILDING MADE EASY.—Being a full and clear description of the art of building the bodies, carriages and cases for all kinds of stairs and steps. Edited by Fred. T. Hodgson, author of "The Carpenter's Steel Square and its Uses," "Practical Carpentry," "Hand Saws," etc., etc. Third Edition, revised and enlarged. New York: The Industrial Publication Co. Cloth; 5 × 7¼ ins.; pp. 153; 137 illustrations in the text.

This handbook was first published twenty years ago, and considerable new matter is included in the present edition. The author literally begins at the beginning of stair-making, and proceeds from the very simple to the more intricate designs, explaining and illustrating each type. The text is simple in expression, and clear even to the layman. Other accepted publications upon this subject are noted, and the illustrations include a large number of good designs for stairways and their details.

Notable Arch Bridges.

TYPES AND DETAILS OF BRIDGE CONSTRUCTION.—Part I. Arch Spans. Examples of Constructed Wooden, Combination, Wrought Iron and Steel Arches for Highway and Railroad Bridges. By Frank W. Skinner, M. Am. Soc. C. E., Associate Editor The Engineering Record, Non-Resident Lecturer on Field Engineering at Cornell University. New York: McGraw Publishing Co. Cloth; 6¾ × 9½ ins.; pp. 294; many illustrations in the text. $3.

This book contains a series of brief descriptions of notable arch bridges. Some of the structures described are of old and obsolete types and are included for their historical interest only, but the majority are modern bridges and of these many are examples of good practice and all are examples of actual practice. There is no attempt in the book to present a discussion of bridge design or calculation or indeed to do more than to set forth by text and illustrations examples of general design and structural details in modern bridge work. This does not mean that items for illustration have been indiscriminately selected or that commonplace details have been exceedingly repeated. On the contrary, the author has shown commendable care in choosing only essential details and presenting them in comparable shape.

The method of treatment is best indicated, perhaps, by a concrete example. The Niagara railway arch, at Niagara Falls, is illustrated by a skeleton elevation and plan, a detail cross-section, a typical truss detail and details of the skewback castings and pin joints. The text gives the location and purpose of the bridge, its mean dimensions, its general structural make-up and detailed descriptions of the special details illustrated. In general the same method of treatment is accorded to each of the structures considered, and the total number considered is some sixty. These are divided and classified into wood and iron arched spans, spandrel braced arches and trusses, and plate girder arches. The book serves a valuable purpose in collecting in one place descriptions and illustrations of a large number of notable arch bridges, and thus rendering it possible for the engineer to review and collate previous practice in the design of essential details.

PREPARING LAND FOR IRRIGATION AND METHODS OF APPLYING WATER.—Prepared by the Agents of Irrigation Investigations. Bulletin No. 145, Office of Experiment Stations. Washington, D. C.: U. S. Department of Agriculture. Paper; 6 × 9 ins.; pp. 84; 7 plates and 33 figures in the text.

The engineering problems connected with irrigation works, or the development of water and bringing it to the land, have been pretty well solved, and no little has been written on the subject. With the agricultural problems, including the application of water to the land, the case is different. The comparative isolation and conservatism of the former and his disinclination to write have combined to produce many solutions or partial solutions of the agricultural problems pertaining to irrigation without much crystallization of opinion as to which is the best. It is the purpose of this bulletin to make public the best of the methods of preparing land for irrigation and of applying water to land, as practiced throughout the irrigated portions of the West. To this end coöperation has been secured of half a score of agents and engineers acting under Mr. A. C. True, Director of the Office of Experiment Stations and more directly under Mr. Elwood Mead, M. Am. Soc. C. E., Chief of Irrigation Investigations. The product of these various authors has been combined and edited by Prof. S. Fortier, Irrigation Engineer, and Mr. R. P.

READY OCTOBER 15th, 190

A Treatise On Concrete Plain and Reinforced

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TRAITE PRACTIQUE DES EMPLOIS CHIMIQUES DU BOIS.—Carbonisation du bois en vases clos, fabrication de l'acide acetique, de l'alcool methylique, da l'acetone et autres produits derives. Par M. Kalb, Ingenieur chimiste de la Societe F. H. Meyer, de Hanovre-Hainholz. Traduit de l'Allemand par Le Docteur L. Gautier. Paris: Libraire Polytechnique, Ch. Beranger. Cloth; 6 × 9¼ ins.; pp. 345; 59 figures in the text. Illustrated. $4.50.

The chemical treatment of wood, for the purpose of obtaining therefrom various trade products, occupies a place of considerable importance among the world's industries. Among these products may be noted acetic acid, methylic alcohol, acetone, creosote, formaldehyde, chloroform, iodoform and various other chemical preparations. The present work goes into the detail of the history of the dry distillation of wood in various countries, and then discusses the chemical composition of wood, its preparation for treatment, and the detailed results of experiments in the dry distillation of various kinds of wood. The fourth chapter takes up modern plants for the treatment of wood, and the methods of operating them for obtaining various products. Another chapter deals with the cost of the process as applied to various kinds of wood; and a succeeding chapter takes up in detail the manner of obtaining a variety of products from what may be called the raw material, resulting from the carbonization of wood, or from the wood-tar, acetate of lime, wood alcohol and charcoal. The final chapter is analytical, relating to the preliminary tests of wood and to the analysis of the various products of wood distillation. In an appendix we have a list of German patents, to the year 1902, relating to processes for manufacturing acetic acid, acetone, wood alcohol, etc. There are a number of illustrations, and the text enters into the detail of the subject with German thoroughness.

Literary Magazines.

The September "Century" is called a "Round the World" number, and it justifies the title by a long list of articles telling of experiences in all corners of the globe, from Borchgrevink's recital of Antarctic explorations to a description of the celebration of the Great Feast of the Whale by the natives of Arctic Alaska. Natal, Java, the Russian Lourdes, the highest volcano in Japan, fossils of Wyoming and Coptic monasteries in Egypt are some of the other places and subjects covered by these Century papers. There is also an account of balloon voyaging as it is carried on for sport by the Paris Aero Club. The writer states that more than a thousand balloon ascensions have been made by members of the club, the number of passengers averaging two and often three and the worst accident on record in the club is a broken foot. This includes only ascensions in balloons proper and not experiments with dirigible ballons or flying machines. An ordinary sized balloon, made of cotton, now the favored material, costs about $600, and the club has balloons which are rented to members at $10 per trip. The total expense of a balloon trip under these circumstances has been brought to very moderate proportions. The writer of the article states that a party of three went by balloon from Paris to Luxemburg and back by train and the entire expense of the trip was about $30 each.

"Workmen's Insurance in Germany" is explained at length by Dr. Fritz Kestner in the September "North American." Few people in this country are aware that workingmen in Germany are insured against accident, against sickness, and against invalidism or infirmity arising from old age. All this insurance is made compulsory by law and is paid for by contributions from employers, from workmen themselves and

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The descriptions include 12 works employing contact beds for final treatment; 5 works employing percolating filters for final treatment; 3 sewage farms; 3 chemical precipitation works. The settling and screening plant at Wiesbaden, the settling tanks at Frankfort-on-Main and the sewage farms of Paris are described in Appendix 1, and a second appendix gives brief descriptions of typical processes of sewage treatment.

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from the national treasury. In 1902, German employers paid about $30,000,000 for accident insurance for the relief of 120,000 workmen injured by accidents, and about $5,000,000 more was paid to the dependents of workmen killed in fatal accidents and $20,000,000 in pensions to those permanently disabled. For old age and invalid insurance, employers and employees paid about $17,000,000 each, and the Imperial treasury contributed $10,000,000. About 490,000 invalid pensions and 180,000 old age pensions are paid annually. The author states that since the establishment of accident insurance much greater care is taken for the prevention of accidents than before.

In the same magazine is a strong paper by Mr. Brooks Adams, entitled "Legal Supervision of the Transportation Tax," in which a convincing argument is made for the establishment of some tribunal empowered to protect the public from undue exactions by the railways in the matter of rates.

The Mesabi iron mines are described in the September "World's Work," and while the story of their wonderful development has been frequently told, probably few even among engineers to-day realize that the whole history of the world's iron production contains no such tale of marvellous richness and of rapid development as the record of the exploitation of Minnesota's iron mines during the past five years. In the same magazine we find a paper on "Our Inland Migrations," in which is given an interesting account of the methods adopted by several of the great Western railway systems to increase population and industries along their lines.

The drainage of the tule lands of California, a piece of agricultural engineering of which very little has been heard, is described in the September "Review of Reviews." The lands referred to are really the delta of the Sacramento River and its tributary, the San Joaquin. The work has been done by clamshell dredges, and the cost of ditching and leveeing has been $15 to $20 per acre. Land drainage on a larger scale is described in the same magazine by the U. S. Consul at Amsterdam, in an article entitled "How the Dutch Have Taken Holland." Few greater pieces of engineering work were accomplished anywhere in the world prior to the birth of men now living than the reclamation of Holland from the sea, and the story is a part of the history of the profession which every engineer ought to know.

The September "Cosmopolitan" is a World's Fair number, and a John Brisben Walker number. The magazine contains 25 articles all devoted to some feature of the Louisiana Purchase Exposition, and all written by or dictated by Mr. Walker, the owner of the magazine. Without attempting to criticize in detail it may be said that if Mr. Walker had delegated the task of discussing engineering exhibits to some competent engineer, he might have avoided inflicting upon his readers a considerable amount of misinformation. For a single illustration, Mr. Walker severely criticises the World's Fair authorities for not presenting a more up-to-date exhibit of modern road-building and says:

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Publications Received.

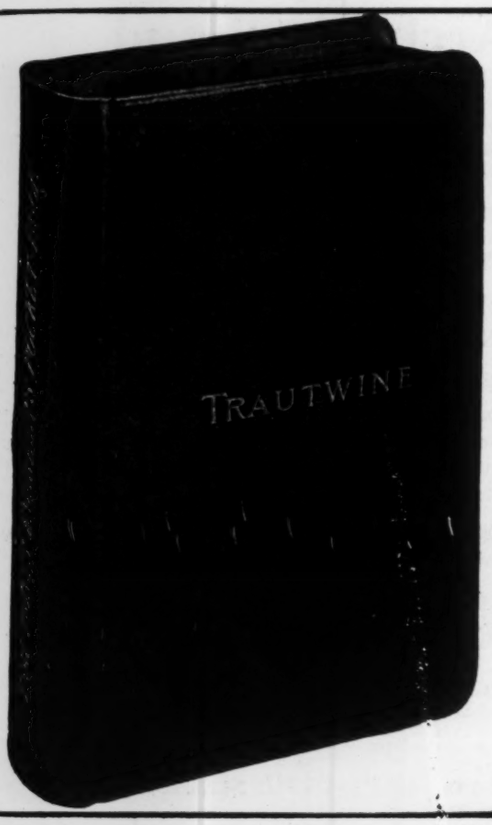
THE INDUSTRIAL AND ARTISTIC TECHNOLOGY OF PAINT AND VARNISH.—By Alvah Horton Sabin, M. S., M. Am. Soc. M. E. New York: John Wiley & Sons. London: Chapman & Hall, Limited. Cloth; 6 × 9 ins.; pp. 372; tables, half-tone plates and illustrations in the text. $3.

CEMENTS, MORTARS AND CONCRETES.—Their Physical Properties. By Myron S. Falk, Ph. D., Instructor in Civil Engineering in Columbia University. New York: M. C. Clark. Cloth; 6 × 9 ins.; pp. 176; tables, plates and figures in the text. $2.50.

ELECTRIC MOTORS.—Continuous Current Motors and Induction Motors, their Theory and Construction. By Henry M. Hobart, M. Inst. E. E., M. Am. Inst. E. E. London and New York: Whittaker & Co. Cloth; 6 × 9 ins.; pp. 458; 480 illustrations, mostly figures in the text. $2.50.

THE GREAT AMERICAN CANALS.—Vol. I. The Chesapeake & Ohio Canal and the Pennsylvania Canal. Being Vol. 13 of Historic Highways of America. Cleveland, O.: The Arthur H. Clark Co. Cloth; 6 × 8 ins.; pp. 231; seven folding and other plates. Complete in 16 volumns, in sets only. $39, net.

STATE BOARD OF HEALTH OF MICHIGAN.—Report of the Secretary, for 1901-2. Lansing, Mich.: Henry B. Baker, Secretary. Cloth: 6 × 9 ins.; pp. xxx. + 254; tables and diagrams.



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